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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/191,743	11/13/1998	RAFFAELE ZAMBRANO	97-CT-174	8970

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EXAMINER

ESTRADA, MICHELLE

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 08/01/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/191,743

Examiner

Michelle Estrada

Applicant(s)

ZAMBRANO, RAFFAELE

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 14 April 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-4,6-16,25-27 and 32-36 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4,6-16,25-27 and 32-36 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-4, 6, 7, 10, 13, 25-27, 32, 33, 35 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liao et al. (5,652,156) in combination with Gardiner et al. (4,354,309), and further in view of Sakai et al. (4,074,300).

Liao et al. discloses growing in a deposition chamber, a first intermediate layer (20) of polycrystalline silicon with a first thickness; after growing the first intermediate layer, stopping all gas flow in the chamber and pumping residual gas out of the chamber, so as to remove all available dopant (Col. 2, lines 55-60); after stopping the gases in the deposition chamber, growing a second additional layer of polycrystalline silicon (22) with a second thickness. It would have been a matter of design choice to completely remove the first source gas before introducing the second source gas because such a step would merely add complexity to the disclosed process without providing any advantages or producing any unexpected results. Liao et al. is not limited to any particular time period between the two steps or any particular atmosphere in the chamber between the two steps. Both layers (20/22) are called polysilicon layers as described in Col. 2, lines 47-48 and also both have grain boundaries (Col. 3, lines 27-28) which indicates that both layers are encompassed by "polysilicon". Alternatively,

Liao et al. discloses growing a polycrystalline silicon layer (20) and growing a second additional layer of polycrystalline silicon (26).

Liao et al. does not disclose that the layers are in-situ doped; the second doping level is lower than the first doping level; and that the first thickness is greater than the second thickness.

Gardiner et al. discloses forming a layer of in-situ doped polycrystalline silicon (11); and forming a second layer of in-situ doped polycrystalline silicon (12) having different doping levels; the first intermediate layer and the second additional layer are of the same conductivity type (n-type); performing a subsequent thermal treatment to diffuse dopant from the first intermediate layer to the second additional layer; the second additional layer providing a barrier during the thermal treatment.

It would have been within the scope of one of ordinary skill in the art to combine the teachings of Liao et al. and Gardiner et al. to enable formation of the polysilicon layers and further the doping of the polycrystalline silicon layer contributes to excessive grain growth with resultant void formation in the polycrystalline silicon gate (Col.1, lines 27-29).

Sakai et al. disclose forming polycrystalline silicon of different doping levels; wherein the second doping level is lower than the first doping level (Col. 2, lines 29-35).

It would have been within the scope of one of ordinary skill in the art to combine the teachings of Liao et al., Gardiner et al. and Sakai et al. to enable formation of the polycrystalline silicon layers.

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Choice of particular thicknesses and doping levels of the polycrystalline silicon layers would have been a matter of routine optimization. Thickness and doping levels depends on the desired device characteristics and dimension. See MPEP 2144.05.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liao et al. (5,652,156) in combination with Gardiner et al. (4,354,309), and further Sakai et al. as applied to claims 1-4, 6, 7, 10, 13, 25-27, 32, 33, 35 and 36 above, and further in view of Shih et al. (5,943,569).

The combination of Liao et al., Gardiner et al. and Sakai et al. does not disclose growing the first intermediate layer by an LPCVD process using a mixture of silane, hydrogen and phosphine.

Shih et al. discloses growing a polysilicon layer (28) by an LPCVD process using silane, hydrogen and phosphine (Col. 5, lines 15-17 and 27-30).

It would have been within the scope of one of ordinary skill in the art to combine the teachings of Liao et al., Gardiner et al., Sakai et al. and Shih et al. to enable formation of the polycrystalline silicon layer and also the gas flow rates can be adjusted to provide a phosphorus dopant concentration in the polysilicon layer (28), eliminating an ion implantation processing step to layer 28, and therefore simplifies the process (Col. 5, lines 28-33).

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Claims 9 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Liao et al., Gardiner et al., further in view of Sakai et al. and Shih et al. as applied to claim 8 above, and further in view of Wang et al. (5,646,061).

The combination of Liao et al., Gardiner et al., Sakai et al. and Shih et al. does not disclose growing a second additional layer by an LPCVD process using a mixture of silane and hydrogen.

Wang et al. discloses growing a polysilicon layer (22) by a LPCVD process using silane and hydrogen (Col. 3, lines 34-36).

It would have been within the scope of one of ordinary skill in the art to combine the teachings of Liao et al., Gardiner et al., Sakai et al., Shih et al. and Wang et al. to enable formation of the additional polysilicon layer and also provides an alternative of gases to grow polysilicon.

Claims 12, 15, 16 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liao et al. (5,652,156) in combination with Gardiner et al. (4,354,309), and further in view of Sakai et al. as applied to claims 1-4, 6, 7, 10, 13, 25-27, 32, 33, 35 and 36 above, and further in view of Hamasaki (6,274,401).

The combination of Liao et al., Gardiner et al. and Sakai et al. does not disclose that the thermal treatment is a re-oxidation treatment to diffuse the dopants.

Hamasaki discloses diffusing dopants by a heat treatment such as oxidation of polycrystalline silicon layer (Col. 2, lines 49-52).

It would have been within the scope of one of ordinary skill in the art to combine the teachings of Liao et al., Gardiner et al., Sakai et al. and Hamasaki to enable formation of the polycrystalline silicon layers and further provides the required dopants concentration profile for a proper operation.

### ***Response to Arguments***

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant argues that Liao et al. disclose alternating the layers of polysilicon and amorphous silicon. However, Applicant is directed to Col. 3, lines 12-13, where Liao et al. teach that the first layer may be polysilicon rather than amorphous silicon, this will lead to two layers of polysilicon because then Liao et al. teach growing a second layer of polysilicon.

Applicant argues that the claimed thicknesses and doping levels are not merely optimized. However, thickness and doping levels are considered result effective variables. In addition, the selection of thicknesses and doping levels, its obvious because it is a matter of determining optimum process conditions by routine experimentation with a limited number of species of result effective variables. These

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claims are prima facie obvious without showing that the claimed ranges achieve unexpected results relative to the prior art range. In re Woodruff, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also In re Huang, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996)(claimed ranges or a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also In re Boesch, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill or art) and In re Aller, 105 USPQ 233 (CCPA 1995) (selection of optimum ranges within prior art general conditions is obvious). Note that the specification contains no disclosure of either the critical nature of the claimed thicknesses and doping levels or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen thicknesses and doping levels or upon another variable recited in a claim, the Applicant must show that the chosen thicknesses and doping levels are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a




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reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michelle Estrada whose telephone number is (703) 308-0729. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

  
George Fourson  
Primary Examiner  
Art Unit 2823

  
MEstrada  
July 22, 2003